

## Research Note

# Prevalence of Larval Trematodes in *Helisoma trivolvis* (Gastropoda) from a Farm Pond in Northampton County, Pennsylvania with Special Emphasis on *Echinostoma trivolvis* (Trematoda) Cercariae

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**ABSTRACT:** Occurrence of larval trematodes and seasonal prevalence of *Echinostoma trivolvis* in *Helisoma trivolvis* snails from a farm pond in Northampton County, Pennsylvania, were investigated from 24 May to 31 October 1995. Of 1,841 *H. trivolvis* snails (7–20 mm shell diameter), 589 were infected based on snail isolation data. Prevalence data showed that 457 (24.8%) released cercariae of *Echinostoma trivolvis*, 52 (2.8%) released cercariae of *Zygocotyle lunata*, 46 (2.5%) released an unidentified species of armatae cercariae, 26 (1.4%) released the psilostome cercariae of *Ribeiroia* sp., 5 (0.3%) released 2 unidentified species of brevifurcate-apharyngeate cercariae, and 3 (0.2%) released the cystophorous cercariae of *Halipegus occidentalis*. The percentage increase in prevalence of *E. trivolvis* was greater than 2-fold in the July versus June collections. Previous reports on larval trematode infections in *H. trivolvis* are discussed.

**KEY WORDS:** *Helisoma trivolvis*, Gastropoda, Trematoda, *Echinostoma trivolvis*, seasonal prevalence, cercariae, larval trematodes.

*Helisoma trivolvis* (Say, 1816) is a ubiquitous planorbid snail in North America and is infected with a variety of larval trematodes (Friesen, 1981). Rosen et al. (1994) reported prevalence of 3 species of digenetic trematodes, *Echinostoma trivolvis* (Cort, 1914), *Cephalogonimus vesicaudus* Nickerson, 1912, and *Spirorchis scripta* Stunkard, 1923, in *H. trivolvis* at Owsley Fork Reservoir in Kentucky. They tested the prediction that autogenic species of trematodes (those that complete their life cycles in hosts living almost exclusively within the pond) would be more prevalent than allogenic species (those that complete their life cycles in hosts that are not always present at the pond). They found that, contrary to their hypothesis, the allogenic species *E. trivolvis* was the most prevalent species.

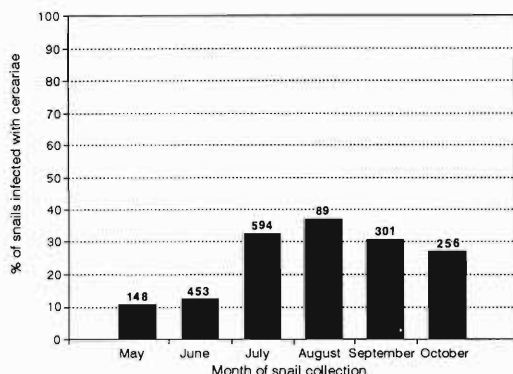
*Echinostoma trivolvis* uses *H. trivolvis* as its first and second intermediate hosts (Kanev et al.,

1995). This snail has been collected from a farm pond in Northampton County, Pennsylvania, by one of us (B.F.) for more than 20 yr to obtain larval stages of *E. trivolvis* for laboratory studies on this echinostome. Other species of larval trematodes were also observed, but no records of the species, their relative abundance, or the seasonal prevalence of *E. trivolvis* were kept. The purpose of this study was to determine which species were present at the study site, calculate the overall abundance of all species found, and observe the pattern of *E. trivolvis* larval prevalence in the snail population during a 6-mo period.

*Helisoma trivolvis* snails were collected biweekly from a farm pond 4 mi north of Bath, Pennsylvania, and 1 mi northwest of Klecknersville, Pennsylvania, at 75°27'15"West, 40°47'20"North. Snails were collected from 24 May to 31 October 1995 ( $\bar{x}$  = 184 per collection; range 59–380) and were taken from the perimeter of the pond, no more than 1.5 m from the edge. The snails were isolated to determine infection with larval trematodes within 48 hr of collection by placing them individually in Stender dishes containing 5 ml of artificial spring water prepared according to Ulmer (1970). Two 50-watt bulbs were placed approximately 30 cm from the dishes to maintain the snails at 28–29°C. Each dish was examined up to 4 hr after snail isolation for cercariae. Live cercariae were examined unstained or stained with 0.01% neutral red and some were also fixed in cold neutral-buffered formalin and mounted in glycerin jelly to aid in specific or generic identification. To approximate the number of infections missed by the isolation procedure, 20% of the isolated negative snails were crushed and examined for larval trematodes.

Voucher specimens have been deposited in the University of Nebraska State Museum, Harold W. Manter Laboratory, Lincoln, Nebraska (HWML 39074–39079).

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**Figure 1.** Percentage of snails infected with *Echinostoma trivolvis* from May to October 1995. The number over the bar equals the sample size for that month.

A total of 1,841 *Helisoma trivolvis* snails ranging in shell diameter from 7 to 20 mm was collected, and 7 species of larval trematodes were found.

Cercarial infections in snails based on isolation were as follows: 457 (24.8%) with the echinostome cercaria, *Echinostoma trivolvis*; 52 (2.8%) with the amphistome cercaria, *Zygocotyle lunata* (Diesing, 1836); 46 (2.5%) with an unidentified species of armatae cercariae; 26 (1.4%) with the psilostome cercaria, *Ribeiroia* sp.; 3 (0.2%) with the cystophorous cercaria, *Halipegus occidualis* Stafford, 1905; 3 (0.2%) with brevifurcate-apharyngeate cercariae with tail finfolds; and 2 (0.1%) with brevifurcate-apharyngeate cercariae without tail finfolds.

The percentage of infection of the most prevalent trematode, *E. trivolvis* was calculated on a monthly basis (Fig. 1). A greater than 2-fold increase in prevalence was observed from June (12.5%) to July (32.6%). A slight decrease in prevalence was observed in September (30.9%) and October (27.1%) compared to August (37.1%).

Necropsies of 250 snails that were negative based on isolation showed that 92 (36.8%) harbored larval trematodes. No double infection was found in any snail based on both isolation and necropsy data, probably due to the low prevalence of larval trematodes other than *E. trivolvis*.

Rosen et al. (1994) recorded the prevalence of *Echinostoma trivolvis*, *Cephalogonimus vesicaudus*, and *Spirorchis scripta* from *Helisoma trivolvis* snails in a reservoir in Kentucky. We

found a greater diversity of larval trematodes in a single location and sharing the same snail host than in the aforementioned study. As in Rosen et al. (1994), *E. trivolvis* was the most prevalent species in the farm pond in Northampton County, Pennsylvania. However, we did not observe the midsummer decline in this species that was reported by Rosen et al. (1994). The increased prevalence of *E. trivolvis* infections from June to July can probably be explained by the development of infections to patency in late spring to early summer. The decreased prevalence of *E. trivolvis* in the fall was possibly due to death of infected snails and/or loss of the infection. Rosen et al. (1994) suspected that the decreased prevalence in *E. trivolvis* and *C. vesicaudus* was due to the entry of large numbers of uninfected snails in the population. We have no evidence to confirm either suggestion as the reason for the decreased prevalence of *E. trivolvis*.

The necropsy data on purported uninfected snails reflect the fact that some infections were not yet patent when the snails were isolated or that cercariae were not released on the day of isolation. Cercarial release from snails, as shown by Schmidt and Fried (1996) for *E. trivolvis* from *H. trivolvis*, did not always occur on a daily basis.

Observations on the brevifurcate-apharyngeate cercariae from the 5 snails infected with this larval type suggested the presence of 2 different schistosoma-like species. The cercaria with finfolds was probably a turtle blood fluke and the cercaria without finfolds was possibly an avian or mammalian schistosoma. Rosen et al. (1994) noted the presence of cercariae of the turtle blood fluke, *S. scripta* from *H. trivolvis* in Kentucky.

The cercaria of *Ribeiroia* sp. may be *R. thomasi*, a species previously described as *Psilostomum ondatrae* by Beaver (1939) from the snail *H. antrosum percarinatum*. Previous reports on cercariae of *Zygocotyle lunata* in *Helisoma* snails include those of Willey (1936) on this species in *H. antrosum* and Fried (1970) on this species in *H. trivolvis*. *Halipegus occidualis* larval infections have been reported from *H. anceps* snails by Goater et al. (1989).

We have no idea what the species of the armatae cercaria is. According to Schell (1985), armatae cercariae occur in the families Plagiorchiidae, Auridistomidae, Cephalogonimidae, Telorchhiidae, and Ochetsomatidae. Rosen et al.

(1994) noted the presence of *C. vesicaudus* (Cephalogoniimidae) cercariae in *H. trivolvis* from Kentucky. Acholonu (1968) reported the occurrence of xiphidiocercariae in 4 (4.3%) of 94 *H. trivolvis* collected in Northern Colorado.

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